











ELECTRICAL WORKING MACHINE

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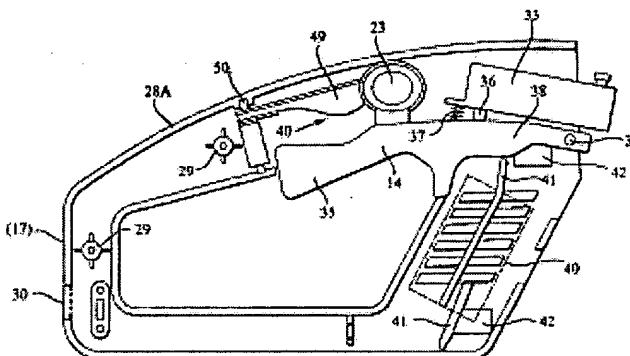
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Abstract of WO03057395

The invention relates to an electric working machine comprising a motor housing accommodating an electric motor, a working tool (4) provided to be rotated by the electric motor, an electric switch for the motor, a rear unit (10) which is connected to the motor housing and comprises a rear, elongated handle (13), and a switch lever (14) which is accessible under the lower side of the rear handle, said electric switch being provided in front of a trigger (35), which forms part of the switch lever.



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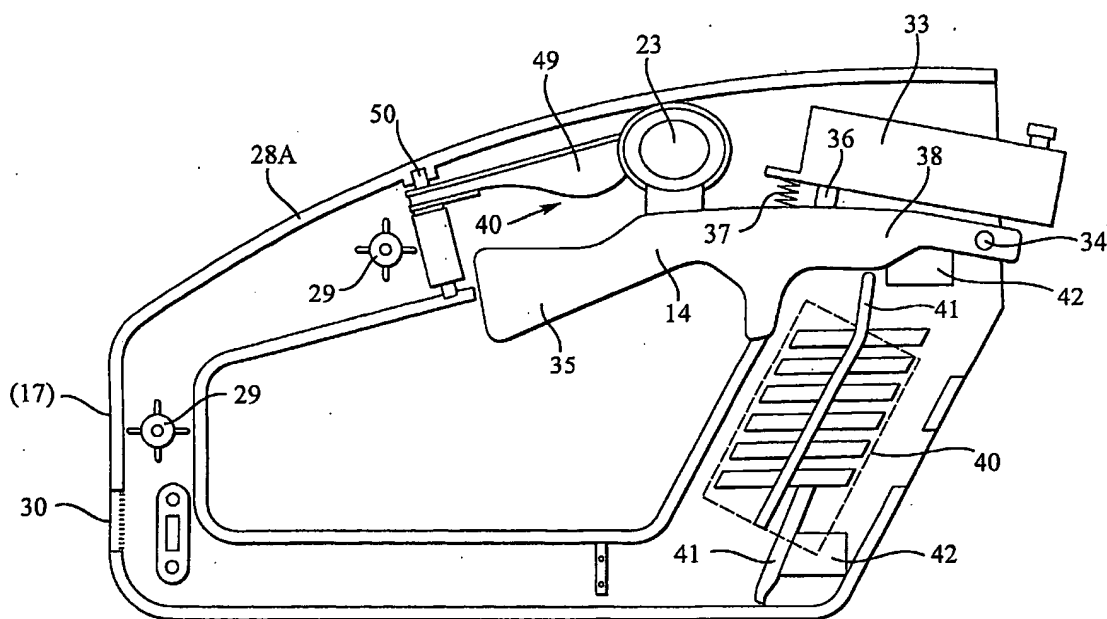
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(54) Title: ELECTRICAL WORKING MACHINE



(57) Abstract: The invention relates to an electric working machine comprising a motor housing accommodating an electric motor, a working tool (4) provided to be rotated by the 5 electric motor, an electric switch for the motor, a rear unit (10) which is connected to the motor housing and comprises a rear, elongated handle (13), and a switch lever (14) which is accessible under the lower side of the rear handle, said electric switch being provided in front of a trigger (35), which forms part of the switch lever.

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ELECTRICAL WORKING MACHINE

TECHNICAL FIELD

5 The invention relates to an electric working machine comprising a motor housing accommodating an electric motor, a working tool provided to be rotated by the electric motor, an electric switch for the motor, a rear unit which is connected to the motor housing and comprises a rear, elongated handle, and a switch lever which is accessible under the lower side of the rear handle. The invention in the first case concerns a high
10 power electric cutting machine.

BACKGROUND OF THE INVENTION

An electric cutting machine of the above mentioned type is manufactured and marketed under the trade name Partner® K2300 EL by a company, which is related to the
15 applicant. It is a typical feature of that machine that the motor housing has a very slender, straight design and also that the rear unit has almost straight, horizontal upper and lower sides. The switch housing with the electric switch is in its entirety located in the rear handle, above a switch lever for the electric switch. The switch housing of a high power machine, as in the present case, consists of a body which takes up quite a lot
20 of space. Therefore the rear handle has a correspondingly bulky design in order to be able to accommodate the switch housing. It is therefore uncomfortable for the operator to grip the handle, which is an ergonomic inconvenience. Because of the geometric conditions, the switch lever is rather short and the return spring, which must be compressed by the operator when the electric switch is switched on and as long as the
25 motor is running, must be comparatively strong. This is tiring, which also is an ergonomic inconvenience.

The known machine also comprises a blocking button for the electric switch, which button has to be inactivated before the electric switch can be switched on. The blocking
30 button is placed in front of the short switch lever on the known machine, at a level under the switch lever, which is not an ideal location, because it does not promote an easy operation.

BRIEF DESCRIPTION OF THE INVENTION

In view of the above background, it is a purpose of the invention to provide an electric working machine and particularly an electric cutting machine, which is advantageous
5 from an ergonomic point of view as compared to known working machines of the type which is mentioned in the above preamble. This can be achieved therein that the invention is characterised by what is stated in the appending patent claims. Further characteristic features, aspects and advantages of the invention will be apparent from the following description of a preferred embodiment.

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BRIEF DESCRIPTION OF THE DRAWINGS

In the following description of a preferred embodiment of the invention, reference will be made to the accompanying drawings, in which

Fig. 1 is a side elevation of an electric cutting machine according to the invention,

15 Fig. 2 shows the interior of a left hand half of a rear unit included in the cutting machine according to Fig. 1 and the functional elements which are provided in the rear unit, and Fig. 3 shows a section of the rear handle and related members along the line III-III in Fig. 1.

20 DESCRIPTION OF PREFERRED EMBODIMENT

With reference first to Fig. 1 an electric cutting machine is generally denominated 1. Its main parts consist of an elongated motor housing 2 accommodating a not shown electric motor, an angular gear 3, a cutter blade 4 which is driven by the electric motor via the angular gear 3 and a horizontal rotation shaft, a guard 5 for the cutter blade 4, a front
25 handle 6 and a rear unit 10. An electric cable 24 can be connected to a not shown electric power source.

The rear unit 10 consists of a front portion 11 and a rear portion 12, to which the electric cable 24 is connected. The rear portion 12 includes a rear handle 13, and under the rear
30 handle there is a switch lever 14. A hand guard is designated 15. On the left hand side of the rear handle 13 there is provided a blocking button 23. An assembly consisting of the angular gear 3, the motor housing 2, and the rear unit 10, which is connected to one

another and arranged after one another in the said order, has a basically elongated, slender shape. The lower side 16 of the motor housing 2 and of the rear unit 10 has an essentially straight shape and is horizontal in a normal working position of the machine. The rear part of the motor housing 2 is designated 20 and a top portion of the rear unit
5 10 and an adjoining part of the rear part 20 of the motor housing is designated 21.

The upper side 18 of the rear unit has a shape which is convex in the upward direction and forms an upwardly inclined arc relative to the straight, horizontal lower side. The arc shape also extends a short distance in and over the rear part 20 of the motor housing
10 2 in the region of said top portion 21. The upper side 19 of the front portion of the motor housing 2, on the other hand is essentially straight and parallel with the lower side 16 such that it in the region of the rear part 20 of the motor housing forms a concave upper side 22, which is terminated as it meets the elongation of the arced, convex upper side of the rear unit 10. Due to the described design of the rear unit 10 and
15 the rear part 20 of the motor housing 2, possibilities are established for the achievement of a very suitable design of the switch lever 14 and also of the accommodation of some functional elements in the first place in the rear unit 10, which in combination, promote a design of the rear handle 13 and of the lever arm 14 which is convenient from an ergonomic point of view and thence also an improvement of the handling of the
20 machine from an ergonomic point of view.

The casing of the rear unit 10 consists of two halves 28A, 28B which contact one another in a central vertical plane in a manner known per se, and which are secured to one another by means of screws. In Fig. 2 there are shown in the left hand halves 28A,
25 screw fastening anchorages 29 for the connection of the halves with one another. In the end piece 17 of the rear unit 10 there is a hole for the electric cable 24. One half of said hole is designated 30 in Fig. 2, and an anchorage for the electric cable is designated 31.

In the top portion 21 there is accommodated an elongated, space consuming switch
30 housing 33, which according to the embodiment accommodates a likewise space consuming electric switch for the motor. The main part of the switch housing 33 is accommodated in the upper part of the front portion 11 of the rear unit 10 and extends a

distance into the motor housing 2. The switch lever 14 is a long lever, which can be rotated under the switch housing 33 about a horizontal axis of rotation 34, in the foremost part of the rear unit 10. The rear section of the switch lever 14 defines a control for the electric switch and consequently of the electric motor and is referred to as trigger 35 in this text. The contact member 36 for the electric switch is provided between the switch lever and the lower side of the switch housing 33 and may form an integrated part of the switch lever or of the electric switch or form a separate element. In either case, the contact element 36 will be displaced into the switch housing 33 when the trigger 35 is moved upwards as the trigger lever 14 is rotated about the front pivot 34, causing the electric switch to be switched on for starting of the motor. A spring 37 between the lower side of the switch housing 33 and the upper side of the switch lever 14 will be compressed when the trigger 35 is moved upwards, and will return the switch lever 14 and the trigger 35 to their lower position, when the operator releases his hold off the trigger 35 in order to stop the motor, causing the electric current to be switched off by the electric switch. As an alternative, the spring 37 can be integrated with the contact member 36 or arranged in some other way in or on either the electric switch or the switch lever 14. Because the switch lever 14 is long, a great power is exerted on the return spring 37, which permits the spring to be made powerful without requesting any large power to be applied on the trigger 35 in order that the motor shall be switched on.

Under the switch lever 14 there is provided in the front portion 11 of the rear unit 10 an electronic unit 50, which is responsible for some functions for the drive of the electric motor of the machine, including control of a soft start of the motor when the electric switch is switched on. The electronic unit 50 may be of a kind which is known per se and does not form any part of the invention as such. It will therefore not be disclosed in detail in this text. However, the specific placement of it in the rear unit forms part of the invention according to an aspect of the invention. In the region of placement of the electronic unit 50, which is only symbolically shown, there are two grooves 41 for an electronic card included in the electronic unit 50. Two securing members for connecting the rear unit 10 to the motor housing 2 are designated 42.

Due to the placement of the switch housing 33 in the front part 11 of the rear unit 10, space is made available over the trigger 35 as compared with known electric powered cutting machines. This is employed according to the invention in order to make the rear handle 13 more slender and therefore easier to grip by the operator. Normally the electric switch, also in the case of known high power type machines where the electric switch requires much space, is placed over the trigger 35, which has required designers to make the handle considerably more bulky and uncomfortable to grip. Maintaining the thus achieved, slender shape of the rear handle 13, there are placed elements in the handle, provided to prevent an intentional start of the machine. These elements are shown in Fig. 3 and comprise a unit 40, which may consist of injection moulded plastic material or compression moulded metal. The blocking bottom 23 forms part of said unit 40 and is accessible through a hole 41 in the left hand side of the rear handle 13. A circumferential, axially directed flange 42 around the hole 41 may optionally be provided in order to prevent unintentional operation of the blocking button 23. It should be understood, however, that an unintentional start also can be prevented by suitable dimensioning of the power of the compression spring 44, which is included in the unit. Inside of the button 23 the unit 40 is provided with a sleeve shaped portion 43, which accommodates said compression spring 44, which can be compressed between the button of the sleeve portion 43 inside of the button 23 and the inside of the rear handle half 28B. A circumferential flange 45 extends in the radial direction, projecting out from the sleeve portion 43, restricting the outwards directed movement of the unit 40 in the region of the hole 41. Two legs 46 on the sleeve portion 43 extend vertically downwards. In the blocking position, these two legs 46 lie in the same plane as the two shanks 47 of the switch lever 14, which shanks extend into the handle 13 through an opening 48 in the lower side of the handle. An elongated arm 49 which is integrated with the unit 40 extends from the sleeve portion 40 rearwise in the handle 13, Fig. 2. The arm 49 is rotatable about a pivot 50 in the rear end of the arm. By rotating the arm 49 about the pivot 50, the shown parts of unit 40 thus can be displaced into the handle 13 therein that the operator presses the button 23 for releasing the blocking unit, and be returned to its blocking position, Fig. 3, by means of the spring 44, respectively. In the blocking position, the two legs 46 on the unit 40 prevent the switch lever 14 from being moved upwards by the operator, since the two legs 46 on the blocking unit 40 form

obstacles in the pathway of the two shanks 47 of the switch lever 14. Not until the operator presses the blocking button 23 inwards, such that the legs 46 are displaced relative to the two shanks 47 so far that they no longer adapt a blocking position, can the operator move the switch lever 14 upwards, such that the shanks 47 of the lever arm will adapt a position to the left of the legs 46 on the blocking unit 40, wherein the motor starts. The operator then may leave hold of the button 23, which now is latched and prevented from returning to the position shown in Fig. 3, because the shanks 47 of the switch lever prevent a return of the blocking unit 40 to blocking position. Not until the operator releases his hold on the trigger 35, so that the switch lever 14 returns to its non-latched position by means of the spring 14, the legs 46 of the blocking unit 40 are released, whereafter the blocking unit 40 readapts its blocking position. It is, according to an aspect of the invention, an essential advantage that the blocking button 23 can be placed on the left hand side of the rear handle, easily accessible by the thumb of the right hand of the operator without jeopardising the blocking function of the blocking unit.

It should be understood that the detailed description of the invention does not restrict the claimed patent protection. It should for example be understood that the electric switch may have the shape of a body which is accommodated in a switch housing, but it may also be void of any specific casing. This means that switch housing is synonymous with switch body or with a switch.

It should also be understood that the invention has been developed in order to improve existing electric cutting machines, but that it also can be applied in connection with other portable, electric working machines, such as for example electric saws, including electric chain saws.

PATENT CLAIMS

1. An electric working machine comprising a motor housing accommodating an
5 electric motor, a working tool (4) provided to be rotated by the electric motor, an electric switch for the motor, a rear unit (10) which is connected to the motor housing and comprises a rear, elongated handle (13), and a switch lever (14) which is accessible under the lower side of the rear handle, c h a r a c t e r i z e d in that the electric switch is provided in front of a trigger (35), which forms part
10 of the switch lever.
2. A working machine according to claim 1, c h a r a c t e r i z e d in that said rear unit (10) comprises a front portion (11) and a rear portion (12), that the electric switch is mounted in said front portion (11) of said rear unit (19), and that the
15 rear handle forms part of said rear portion (12) of said rear unit.
3. A working machine according to claim 1 or 2, c h a r a c t e r i z e d in that the electric switch is elongated and oriented in the longitudinal direction of the rear handle, that a rear section (35) of the switch lever, said rear section forming said
20 trigger, is movable in a slot (48) in the lower side of the rear handle by rotation about a horizontal axis of rotation, and that a front section (38) of the switch lever extends into said front portion of said rear unit for operation of the electric switch.
- 25 4. A working machine according to any of claims 1-3, c h a r a c t e r i z e d in that said front portion of the rear unit also accommodates an electronic unit (59) for control of the drive of the electric motor.
5. A working machine according to claim 4, c h a r a c t e r i z e d in that the
30 electric switch is provided in or has the shape of a switch housing (33), which mainly is provided above the front section (38) of the switch lever, and that the electronic unit (50) is provided under the front section (38) of the switch lever.

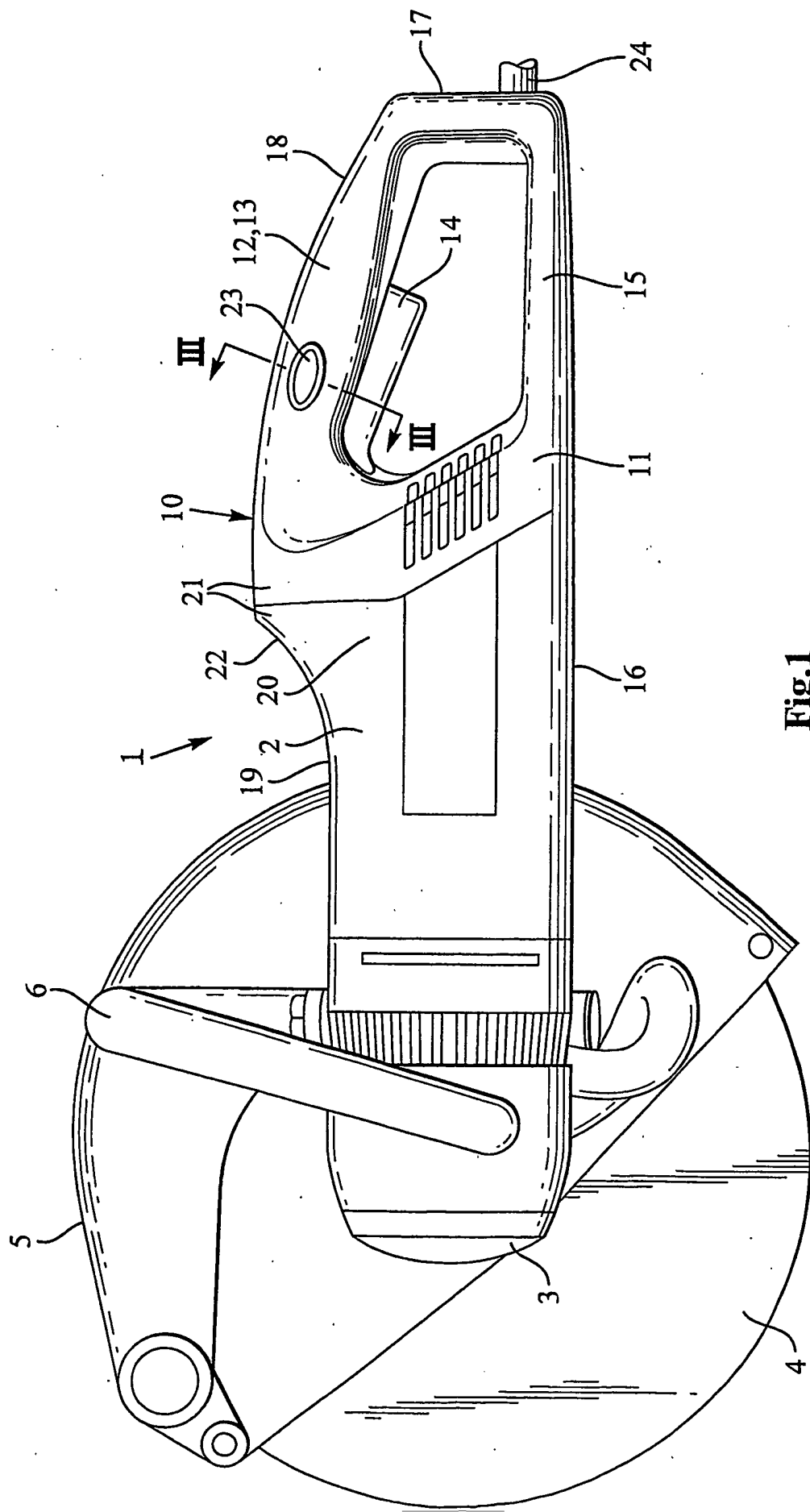
6. A working machine according to any of claims 1-5, characterized in that the upper side (18) of the rear unit slopes slightly upwards relative to the lower side (16) of the working machine in the horizontal working position of the machine, that a top portion (21) is formed by a front, upper part of the front portion of the rear unit in front of the rear handle and by an adjoining part of the motor housing, and that the electric switch is mounted in said top portion.
7. A working machine according to claim 6, characterized in that the upper side (19) of a front part of the motor housing (2) is essentially lower than that part of the motor housing which adjoins said rear unit.
8. A working machine according to any of claims 1-7, characterized in that the axis of rotation (34) of the switch lever is located at the front end of the switch lever, adjacent to a front end of said rear unit.
9. A working machine according to any of claims 1-8, characterized in that an operation element (36) of the electric switch is provided between the front section of the switch lever and the electric switch in a position at the rear of the axis of rotation of the switch lever for switching the electric switch on and off by the upwards and downwards directed movements, respectively, of the switch lever.
10. A working machine according to any of claims 1-9, characterized in that the electric switch is provided in or forms an integrated part of an elongated switch housing (33).
11. A working machine according to any of claims 1-10, characterized in that a blocking device is provided against unintentional starting of the motor, said blocking device, when it is in a position uninfluenced by the operator, which is an active blocking position, prevents the switch lever from being moved upwards from its inactive switch off-position, while the blocking device, when it is in a release position, which the blocking device can adopt by action

by the operator, releases the switch lever, permitting the switch lever to be moved upwards by the operator for switching on the electric switch.

12. A working machine according to claim 11, characterized in that the
- 5 blocking device includes a blocking unit in the rear handle above the rear section of the switch lever, said blocking unit being provided to be inactivated by lateral displacement by the operator from said active blocking position to said inactive release position by means of a button (23) provided in a lateral side of the rear handle, that at least a first spring member (37) is provided to return the switch
- 10 lever by spring power from its switch-on position to its active switch-off position, and that at least a second spring member (44) is provided to return the blocking unit by spring power from the release position to the active blocking position but not before the switch lever has been returned to its inactive off position by means of said first spring member.

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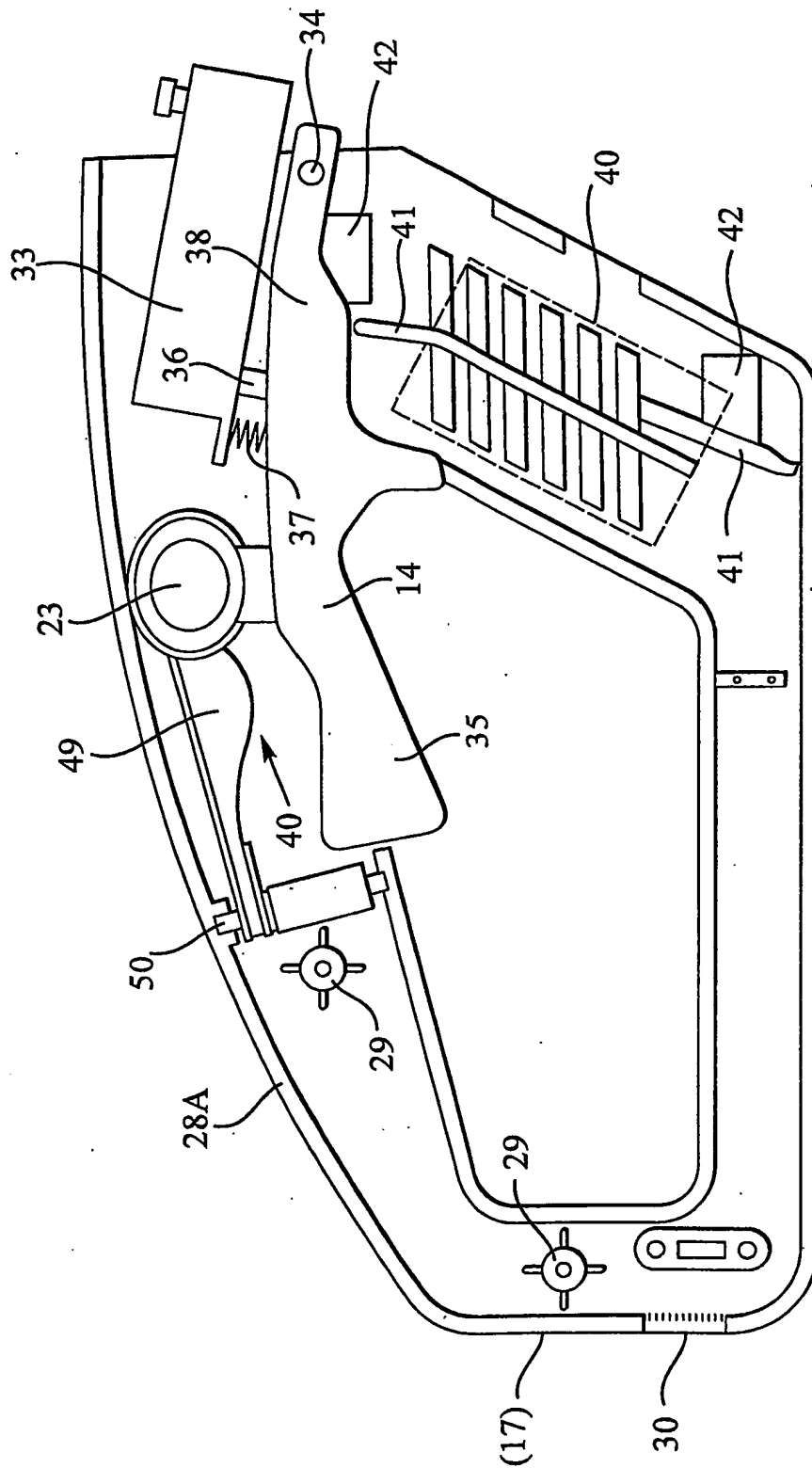


Fig.2

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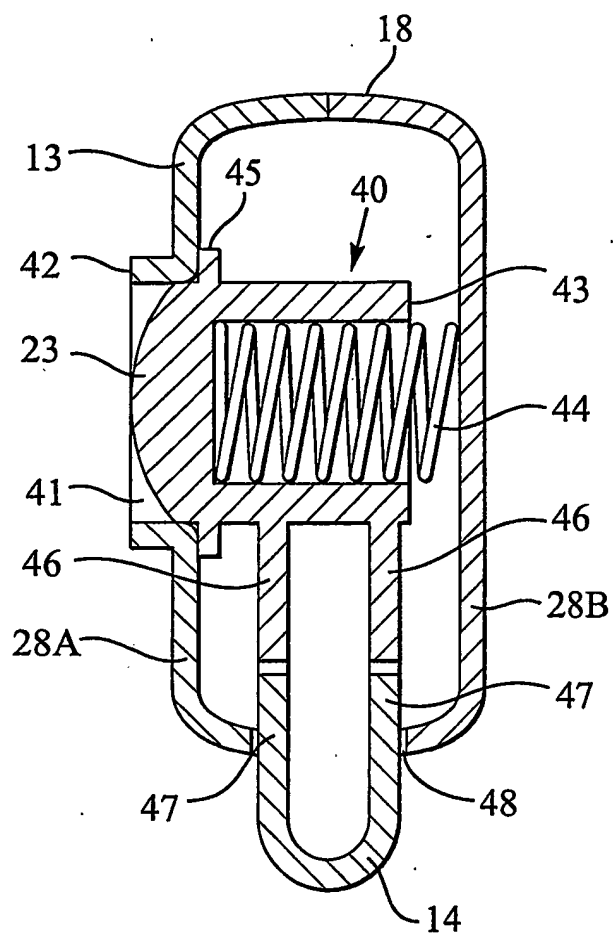


Fig.3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/02071

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B23D 45/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B23D, H02P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4578863 A (RAYMOND R. LAVERICK), 1 April 1986 (01.04.86), column 2, line 1 - line 8; column 2, line 35 - line 45, figure 1, abstract	1-3,6,8
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Y	DE 3240080 A1 (FESTO-MASCHINENFABRIK GOTTLIEB STOLL), 3 May 1984 (03.05.84), page 5, line 24 - page 6; page 20, figure 1, abstract	4,5
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"B" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

9 April 2003

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/02071

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT
Information on patent family members

29/03/03

International application No.

PCT/SE 02/02071

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INTERNATIONAL SEARCH REPORTInternational application No.
PCT/SE02/02071**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☒ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

The invention according to claim 1 relates to an electrical working machine comprising an electrical motor, a rotating tool and a switch for the electrical motor. The rear part of the machine comprises a handle in which a lever for actuating the switch is provided. The switch is located at a position forward of a trigger part of the lever, thus solving the problem of providing an electrical working machine with an ergonomically designed handle. An electrical working machine as described above is known through US 4578863 A1. Consequently, the application has been found, a posteriori, to constitute two groups of inventions:

I. The invention according to claims 2-3, 6-12 relates to an electrical working machine as described above, where the technical features of claims 2-3, 6-10 relate to the design of the rear part of the machine and the construction of the switch. The technical feature of claims 11, 12 is a safety device for preventing accidental start of the motor.

II. The invention according to claims 4 and 5 relates to an electrical working machine as described above, where the special technical feature is an electronic unit for controlling the electrical motor.

Since the two groups of claims are not so linked that they form a single general inventive concept it appears that, a posteriori, the application does not satisfy the requirements of unity of the invention.